

# 19: CLT-based Inference for Proportions

Stat 120 | Fall 2025

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1. APM Research Lab ran a [survey of likely Minnesota voters](#) between Sept 16-18 of this year. They reported 48.4% in support of the Harris/Walz ticket, and 43.3% in support of the Trump/Vance ticket.

Here's an excerpt from their methodology report:

*The margin for error, according to standards customarily used by statisticians, is no more than  $\pm 3.5$  percentage points. This means that there is a 95% probability that the “true” figure would fall within that range if all voters were surveyed.*

- (a) Show how the margin of error was computed
  - (b) Is it OK to use the normal distribution as a model for the sampling distribution of a proportion in this case?
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2. In a random sample of 100 moviegoers in January 2013, 64 of them said they are more likely to wait and watch a new movie in the comfort of their own home.
- (a) Is it ok to use the normal distribution as a model for the sampling distribution of the proportion of moviegoers preferring to wait and watch at home?

- (b) Suppose I want to know if more than 50% of moviegoers in the population prefer to wait and watch at home. Write down the corresponding null and alternative hypotheses.
- (c) For the hypothesis test in part (b), find the standardized test statistic (i.e., the Z-score).
- (d) Calculate the p-value and state a conclusion in context
- (e) The table below gives some of the percentiles of the  $N(0,1)$  distribution. If you were given this table (for example on an exam, where you do not have access to R), what could you say about the value of the p-value?

| percentage | percentile ( <code>qnorm(percentage)</code> ) |
|------------|---|
| 90%        | 1.3   |
| 95%        | 1.6   |
| 97.5%      | 2.0   |
| 99%        | 2.3   |
| 99.5%      | 2.6   |

- (f) Compute and interpret a 90% confidence interval for the population proportion of moviegoers who believe they are more likely to watch a new movie from home. (Use the information from the previous table to find the critical value needed.)

- (g) How big of a sample size would you need if you wanted the margin of error for a 90% confidence interval to be no more than 2%? To answer this question, assume that the true proportion is  $p = 0.5$ , which would result in the biggest margin of error for a given sample size.